Claims

What is claimed is:

1. An optical switch comprising:

a pair of opposed optical arrays, each optical array including a fixed mirror and a plurality of independently tiltable mirrors;

at least one input port, disposed within one of the optical arrays, for launching a beam of light towards the fixed mirror in other optical array, which redirects the beam of light for multiple passes between the tiltable mirrors in both optical arrays to the fixed mirror in the one optical array;

at least two output ports, disposed within the other optical array, for selectively receiving the beam of light from the fixed mirror in the one optical array; and

an ATO element having optical power disposed between the pair of opposed optical arrays for directing the beam of light passing between the optical arrays.

2. The optical switch as defined in claim 1, wherein the pair of opposed optical arrays is disposed in respective focal planes of the ATO element.

3. The optical switch as defined in claim 2, wherein the ATO element has a focal length approximately equal to a near zone length or Rayleigh range of a beam of light incident thereon.

4. The optical switch as defined in claim 2, wherein the at least one input port and the at least two output ports are optical bypasses for allowing a beam of light to pass through a respective one of the pair of opposed optical arrays.

5. The optical switch as defined in claim 4, wherein the pair of opposed optical arrays, the at least one input port, the at least two output ports, and the ATO element are disposed about an optical axis of the ATO element.

6. The optical switch as defined in claim 5, wherein the fixed mirror of each of the pair of opposed optical arrays is positioned along the optical axis of the ATO element.

7. An optical switch comprising:

at least one input port for launching a beam of light into the optical switch;

at least two output ports for selectively receiving the beam of light from an optical path between the at least one input port and a selected one of the at least two output ports;

an angle-to-offset(ATO) element having optical power for performing an angle-to-offset transformation, said ATO element being disposed for redirecting the beam of light traveling between the at least one input port and the at least two output ports;

a first plurality of independently tiltable deflectors and a second plurality of independently tiltable deflectors the first and the second plurality of independently tiltable deflectors for switching the beam of light along an optical path via the ATO element; and

at least one fixed deflector for receiving the beam of light from each input port via the ATO element, for deflecting the beam of light to one of the first plurality of independently tiltable deflectors via the ATO element, for receiving the beam of light from one of the second plurality of independently tiltable deflectors via the ATO element and for deflecting the beam of light to a selected one of the at least two output ports via the ATO element.

8. The optical switch as defined in claim 7, wherein the ATO element has a focal length approximately equal to a near zone length or Rayleigh range of a beam of light incident thereon.

9. The optical switch as defined in claim 8, wherein the at least one input port, the at least two output ports, the ATO element, the first array of deflectors, and the second array of deflectors are disposed about an optical axis of the ATO element.

10. The optical switch as defined in claim 9, wherein the beam of light is redirected five times by the ATO element along an optical path between the at least one input port and a selected one of the at least two output ports.

11. The optical switch as defined in claim 9, wherein the first plurality of deflectors and the second plurality of deflectors are disposed on a first MEMS chip and a second MEMS chip, respectively; and wherein the at least one input port and the at least two output ports are disposed at optical bypass regions of the first and the second MEMS chip, respectively.

12. The optical switch as defined in claim 7, wherein the ATO element is one of a focusing lens, a GRIN lens, and a concave mirror.

13. The optical switch as defined in claim 7, wherein the ATO element is a concave mirror; and wherein the at least one fixed deflector comprises a single fixed deflector.

14. The optical switch as defined in claim 13, wherein the at least one input port, the at least two output ports, the first plurality of deflectors, the second plurality of deflectors, and the single fixed deflector are disposed adjacent each other remote from the concave mirror.

15. An optical switch comprising:

at least one input port for launching a beam of light into the optical switch;

at least two output ports for selectively receiving the beam of light;

an angle-to-offset (ATO) element having optical power; and

a first array of deflectors and a second array of deflectors for switching the beam of light from the at least one input port to a selected one of the at least two output ports,

wherein the switching is performed along an optical path including the first and the second array of deflectors and the ATO element, and

wherein the beam of light is redirected five times by the ATO element when switching a beam of light to a selected one of the at least two output ports.

16. The optical switch as defined in claim 15, wherein the first array of deflectors includes a first fixed micro-mirror and a first plurality of tiltable micro-mirrors, and the second array of deflectors includes a second fixed micro-mirror and a second plurality of tiltable micro-mirrors.

17. The optical switch as defined in claim 15, further comprising a fixed deflector for directing the beam of light between each input port and the first array of deflectors via the ATO element, and for directing the beam of light between the second array of deflectors and one of the output ports via the ATO element.

18. The optical switch as defined in claim 17, wherein the ATO element comprises a concave mirror.

19. The optical switch as defined in claim 18, wherein the at least one input port, the at least two output ports, the first plurality of deflectors, the second plurality of deflectors, and the single fixed deflector are disposed adjacent each other in a focal plane of the concave mirror.

20. The optical switch as defined in claim 18, wherein the single fixed deflector is disposed along an optical axis of the concave mirror; wherein the first plurality of deflectors and each of the input ports are disposed on opposite sides of the single fixed deflector; wherein the second plurality of deflectors is disposed adjacent to the first plurality of deflectors; and wherein the output ports are disposed adjacent to each of the input ports.